Relationship Between Crystallized and Fluid Intelligence and Success on The Night Out Task: A Measure of Everyday Functioning

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Background

• The Night Out Task (NOT) was created to test everyday functional abilities in individuals by mimicking complex, open-ended situations people may experience in everyday life in the clinic

• Efficient and accurate assessment of an older adult's functional ability is necessary for evaluating and addressing safety concerns, informing clinical diagnoses and initiating appropriate intervention • This study explores how crystallized and fluid intellectual abilities affect success on the NOT variables in a sample of older adults • We hypothesized that fluid intelligence will be a stronger predictor than crystallized intelligence of NOT performance due to the novelty of the task

Methods

Participants

• 47 older adults between the ages of 50 and 83 (M age = 63.72, SD = 8.22) who completed the NOT in a lab setting

Procedure

 Individuals were tasked with preparing for a night out, which required completing eight subtasks

• Participants were provided a detailed written list of the subtasks that needed to be completed for the night out (see Table 1)

 Participants were instructed to multi-task and interweave the tasks so that the tasks could be completed efficiently

• The recently completed digital NOT app was used to score their behavior

NOT Scores

• <u>Total Time</u> (in seconds): Total time to complete NOT

• Total Errors: Sum of all errors made on the NOT

• Accuracy Score: Each subtask receives a completion score (see Table 2), which are then summed. Prototype app shows a list of potential situations (errors) that would result in each of the eight subtasks being coded as inefficient, incomplete or inaccurate (see Figure 5)

• <u>Sequencing Score</u>: Summed number of six possible efficient sequences

Table 1. NOT Tasks

Eight Tasks

Choose movie snack (rules) Phone friend just prior to leaving Locate recipe and gather ingredients Plan movie trip Bring bag to exit Prepare tea (takes 3 min) Get correct movie change Pack travel bag

Table 2. NOT Completion Scores

Completion Scores for each Subtask

1 = Completed Efficiently: no errors. 2 = Complete Inefficiently: \geq 1 inefficient error

 $3 = Incomplete/Inaccurate: \geq 1 error$ causing subtask to be completed inaccurately

4 = Not Attempted

Questionnaires

• Participants also completed neuropsychological tests from the NIH toolbox that assessed:

- <u>Crystallized Intelligence</u>: Knowledge acquired throughout life
- Fluid Intelligence : Ability to solve novel problems
- Scores were reported as standardized scores that accounted for age and education

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Results

• Regression analyses were completed to determine whether crystallized and fluid intelligence predicted NOT task performances • As seen in Table 3, a significant regression equation was found for total errors, with crystallized intelligence emerging as a significant predictor (*p*<.05)

• A significant regression equation was also found for total time, with fluid intelligence emerging as a significant predictor (p<.005)

• The regression model did not yield significant predictors for the sequencing or accuracy scores





Figure 2. Recipe, Snack and Tea Items in Cupboard A



Figure 3. Recipe book and items in Cupboard B





Figure 5. NOT tablet coding Application

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Recipe START GATHERS ITEMS BEFORE READING RECIPE RETRIEVAL INEFFICIENT (>2 TRIPS EACH CUP.) DOES NOT EFFICIENTLY LOCATE RECIPE (INDEX/TOO GATHERS CREAMY PB, NOT CHUNKY GATHERS TABLE SALT, NOT KOSHER GATHERS COFFEE, NOT ESPRESSO GATHERS EXTRA ITEMS DOES NOT GATHER 1-2 NONESSENTIAL ITEMS ARRIES ALL ITEMS TO BAG, NOT BAG TO ITEMS MAKES CHANGE AFTER FINISHING TASK THERS GRANULATED SUGAR, NOT POWDERE DOES NOT GATHER 1+ ESSENTIAL ITEMS DOES NOT GATHER 3+ NONESSENTIAL ITEMS LOCATES NO OR WRONG RECIPE AND GATHERS ITEMS DOES NOT FINISH TASK Exit AKES MULTIPLE TRIPS TO DOOR NOT ONE OF LAST 2 TASKS S NOT BRING BAG TO DOO DOES NOT FINISH TASK

Movie START COMMENTS LOOK IN MULTIPLE LOCATION **RECORDS LEAVING BEFORE 6:2** RECORDS >\$7 SENIOR, >\$11 ADUL RETURNS TO SCHEDULE AFTE FINISHING TASK CORDS COST FOR ONLY ONE PERS DOES NOT RECORD ANSWERS

DOUBLE-CHECKING

RECORDS <\$7 SENIOR, <\$11 ADULT RECORDS LEAVING AFTER 6:35 DOES NOT FINISH TASK hone START COMMENT LOOKS IN MULTIPLE LOCATIONS CALL IS NOT LAST TASK BEFORE EX CALLS BUT DOES NOT MENTION LEAVIN MAKES CALL MORE THAN ONCE **DOES NOT CALL GETS PHONE BUT DOES NOT CALL**

DOES NOT FINISH TASK

SELF-CORRECTION NTRA QUESTION Travel Bag START COMMENTS Snack START LOOKS IN MULTIPLE LOCATION TAKES MORE THAN ONE SNACK CHOOSES CANDY, NOT MILK CHOO CHANGES SNACK AFTER FINISHING TASK CHOOSES NON-SNACK ITEM CHOOSES DARK CHOC. DOES NOT BRING SNACK TO DOOR DOES NOT FINISH TASK Change START COMMENTS LOOKS IN MULTIPLE LOCATIONS ATHERS \$ BEFORE CHECKING SCHEDULI GATHERS MORE \$ THAN RECORDED ADJUSTS \$ AFTER FINISHING TASK **GATHERS LESS \$ THAN RECORDED** OES NOT TAKE \$ OUT OF POCKET AT END DOES NOT BRING \$ TO DOOR

Mid-Task Planning START

DOES NOT FINISH TASK

LOOKS IN MULTIPLE LOCATIONS CARRIES ITEMS TO DOOR BY HAND ISES ALTERNATIVE CARRIER, NOT BA S NOT PUT ITEMS IN BAG (EXCEPTION TEA, \$, PHONE BY HAND) DOES NOT FINISH TASK ea START COMMENTS LOOKS IN MULTIPLE LOCATIONS WAITS FOR TEA, NOT MULTITASKING GETS TEA, NOT DIRECTLY PUT IN THER MAKES TEA MORE THAN ONCE DOES NOT START TIMER DOES NOT WAIT ≥ 3 MINUTES **NO TEA IN THERMOS** NO WATER IN THERMOS MAKES COFFEE DOES NOT TAKE TEA TO DOO DOES NOT FINISH TASK



Figure 4. Movie Schedule and Change



Table 3. Summary of Regression Analysis of NOT variables

	NOT Total Time	NOT Total Errors	NOT Accu Scor
Crystallized Intelligence	113	315*	257
Fluid Intelligence	419**	264	185
R²	.195	.182	.10
F for R ²	5.699**	4.663*	2.5

Note: Standardized Beta Coefficients reported for predictors. * Indicates p < .05 and ** Indicates p < .01

Conclusions & Future Implications

• In a sample of healthy older adults, crystallized intelligence was a significant predictor of NOT total errors and fluid Intelligence of NOT total time

 The findings may suggest that knowledge gained through experience may be important for completing the task components without making errors

• Concomitantly, fluid intelligence, which declines with age and is important for novel problem-solving, may be important for quick and efficient task execution

• These suppositions will require further exploration • This project may have been limited by the small sample size of participants and the homogeneity of intelligence scores of the participants

• Moving forward, we would like to validate the NOT as a clinicbased measure of everyday functioning

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iracy e	NOT Sequencing Score
	.030
	.031
5	.002
533	.042